

ALTERED STATE OF CONSCIOUSNESS AND SEXUALITY

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The sexological research is changing in the two last decades thanks to the contributions of neurosciences and to a freer activity less bound to cultural and religious ties. At the same time, needs of advice or intervention arise in areas previously considered less relevant to the people sexuality, or on issues that have been sometimes neglected by scientific research. For this reason, the same sexology is opening itself more and more towards less medical and pathological areas and giving prevalence to those aspects more connected to prevention, information, to a greater fullness of people's well-being. As well as integrating to a greater degree the physiological components with the psychological and social-relational and neuro-sociological components. Not only sex addiction, but also some orgasmic disorders, some sexual obsessive disorders, to mention some of the most common, could be better understood and resolved.

In this context, the study of the altered states of consciousness, especially of those borderline states very close to normal ordinary consciousness, has lately received more attention and rightly moved several scholars to include not only the para-hypnotic situations [1] but also sexual activities and phases that could be assimilated to altered states. Sexual activities and orgasm, that we could simply name as "sexual states", including the several arousal modalities and forms till orgasmic responses, represent some of the common physically or psychologically induced altered states of consciousness (ASC), even if their study has not yet received enough researches, probably due to their cultural and social nature. Sexual states involve, at different levels, dynamics and psychosomatic processes so as signalling molecules, receptors, the central nervous system and brain activities [2]. A whole system, surely more complex than the common point of view, describing sexuality as mainly emotional, hormonal and physical. Maybe a point of view a bit closer to the Freud's one: "***the sexual instincts are remarkable for their plasticity, for the facility with which they can change their aim ... for the ease with which they can substitute one form of gratification for another***" (Freud 1938). Not as much as psychoanalysis theory but as the central place of

sexuality in individual and social life, and the plasticity power of sexuality. The fact that sexual life is almost everywhere socially and culturally regulated and that, at the same time, sexual and erotic signals have a conspicuous presence in societies and mass media, suggests giving much more attention to this area of study that, for its multiple manifestations and forms in everyday life, offer a kind of “natural” social laboratory. Moreover, the study of these aspects may have a direct impact on clinic counselling, sexology, applied neurosciences, and so on. Problems like sexual dysfunctions (sexual desire disorders, sexual arousal disorders, orgasm disorders, sexual pain disorders) and sex addiction [3] can suggest new diagnostic and therapeutic pathways, suggestions for integrative therapies, multidimensional approaches, etc.

A basic difference can be the starting point: sexual desire and sexual arousal as connected but separated pathways. Sexual desire is usually defined as the behavioural drive that motivates individuals to fantasize about, or seek out, sexual activity. In contrast, sexual arousal is defined as the autonomic physiological processes that prepare the body for sexual activity. It is important to make clear distinctions between the two definitions as confusion can occur due to, the often- simultaneous occurrence of both mechanisms. In fact, sexual desire is the culmination of several different neural mechanisms, each is controlled in different areas of the brain and is activated at different times of the sexual experience. Animal research suggests that limbic system structures such as the amygdala and *nucleus accumbens* are especially important for sexual motivation, the medial preoptic area (an area of the *hypothalamus*) is involved in the ability to engage in sexual behaviour, but it does not affect sexual motivation. In contrast, the amygdala and *nucleus accumbens* are involved in motivation for sexual behaviour, but they do not affect the ability to engage in it. Although human sexual behaviour is much more complex than that seen in animals, also because of social and cultural factors, some parallels between animals and humans can be drawn from some of these researches. The worldwide popularity of drugs used to treat erectile dysfunction speaks to the fact that sexual motivation and the ability to engage in sexual behaviour can also be dissociated in humans. Moreover, disorders that involve abnormal hypothalamic function are often associated with hypogonadism (reduced function of the gonads) and reduced sexual function (e.g., Prader-Willi syndrome). Given the hypothalamus’s role in endocrine function, it is not surprising that hormones secreted by the endocrine system also play important roles in sexual motivation and behaviour. In spite differences, there is considerable evidence that sexual motivation for both men and women **varies** as a function of circulating testosterone levels even if it doesn’t depend only by this level [4]. In several studies over the past decades, changes in the electrical activity of the human brain during sexual arousal and orgasm have been described, so as have been reported rapid low-voltage

activity during early stages of sexual arousal that was followed by slow high-voltage paroxysmal activity during orgasm. It has been recorded slow wave and spike activity with interspersed fast activity mainly in the septal region during orgasm. H.D. Cohen, Rosen, and Goldstein [5] showed that alpha waves in both hemispheres during baseline give way to high-amplitude 4-Hz activity over the right parietal lobe during orgasm, which was not visible during a “faked orgasm.” This inter-hemispheric asymmetry has been observed by several researchers in different experimental and field situations, also using computed tomography, associating the orgasmic response mainly to the right hemisphere (mainly the prefrontal cortex). So as evident differences have been found in the EEG between in different sexual states and phases.

Neurosurgery and brain lesions after injury have revealed the involvement of frontal and temporal areas in the inhibitory control of sexual behaviour [6] and septal nuclei in the control of sexual arousal [7]. Other researches presented their male subjects with visual sexual stimuli in the PET scanner, founding a significant bilateral increase of regional cerebral blood flow in the *claustrum* and *putamen*, which was positively correlated with perceived sexual arousal. Further activated region are: the *nucleus accumbens* and the rostral part of the anterior cingulate gyrus. The *nucleus accumbens* serves as the common final end-path of the dopamine incentive system and therefore plays an unspecific role in the organization of sexual responses. The magnitude of activation of the latter correlated strongly with penile tumescence. In contrast, activity in temporal lobes decreased during an increase of sexual arousal [8]. Among the later studies, the Dietrich work suggests [9] that the brain areas, during altered states of consciousness, undergo temporary functional variations and involvement, so as hierarchies and integrations. Neuronal synchrony too [10] may help in explaining conscious experiences and, indirectly, its absence. But it is mainly the holistic approach revealing its potential for explanation [11]. In summary, subcortical paroxysmal and right hemispheric high-amplitude slow activity appear to be related to the **partial loss of consciousness during orgasm**. Along with sexual arousal and orgasm, a lateralized right hemispheric activation occurs. These modifications of the EEG clearly classify orgasm as a specific ASC not comparable to any other psycho-physiological states.

Further suggestions come from the relevant contribution of Vaitl [12] who suggested to adopt both a five levels taxonomic list and four parameters of phenomenological dimensions of ASC. By them, sexual states have been classified at level 2 of the list [13], physically and physiologically induced ASC. Regarding the four parameters dimensions, they are: activation, awareness span, self-awareness, sensory dynamics. *Activation* in its broadest biological meaning refers to the readiness of an organism to interact with its physical or social

environment. Activation is one of the most important dimensions in objective description of behaviour, even in organisms to which we do not (or only hesitatingly) attribute consciousness. *Awareness span* refers to the variability of the contents available to attention and conscious processing. Awareness span ranges from narrow, focused attention directed at a singular content (e.g., in an intense mental activity) to broad, extended awareness embracing “all the things” in a single grasp (e.g., contemplating the horizon) [14]. *Self-awareness* refers to the other pole of the bipolar self–world structure of human experience. In a reflective attitude, all experience is “mine,” that is, related to the subject’s self. *Sensory dynamics* comprise the variety of changes in the sensory and perceptual component of subjective experience. With varying states of consciousness, sensation may be reduced (higher thresholds, anesthesia) or enhanced (lower thresholds, hyperesthesia); some ASC are characterized by a particular production of sensations and perceptions even without an adequate physical stimulus (e.g., synesthesia, dreams, hallucinations). Crossing the five levels list and the four dimensions, it results that the different sexual states, produce ASC that, differently from the other states physically and physiologically induced, have bigger activation but not an increase in self-awareness [15]. The modifications of the EEG and the detected differences between the type of induction and the dimensional variables clearly classify orgasm as a specific ASC not comparable to any other psycho-physiological state or condition. Moreover, recent researches about sex addiction [16] and altered perceptions confirms the importance of sexual states as privileged area of study to explore better and understand the altered states of consciousness connected to some obsessive and compulsory behaviour, addiction modalities and symptoms.

In summary, the studies of sexology are enriched by the numerous contributions of neurosciences and by the neuro-sociological indications related to wellbeing that were previously underestimated or ignored. Yet more, the study of altered states of consciousness is, rightly, devoting more space to sexuality in its various implications. Through a synthetic nod to the main paths and structures involved in two of the most common sexual aspects, desire and excitement, weaving various study perspectives [17], new potential research paths emerge that can be useful in at least some of the disorders related to sexuality. This highlights the importance of ASCs in the forms of addiction, obsessive behaviour and in some other disorders.

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